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REMARKS.

I. Drawing Objection

The Examiner has objected to the drawings under 35 CFR 1.84(o) on the basis that "the generic blocks should be provided with descriptive labels." This ground of rejection is respectfully traversed.

Applicant respectfully submits that Figures 1 and 2, the only two drawing figures of the present application, do not have any unlabeled "generic blocks." Specifically, Figure 1 shows a generic block or rectangular box 40 that includes the descriptive label DC POWER SUPPLY. Figure 2 shows rectangular box 33 including the descriptive label CONTROLLER, rectangular box 54 including the descriptive label PULSER/RECEIVER, rectangular box 56 including the descriptive label PULSER/RECEIVER, and rectangular box 58 including the descriptive label DATA ACQUISITION AND ANALYSIS SYSTEM. With respect to the position sensors 27 and 29 of Figure 2, these are intended to be depictions of structural elements and not generic blocks that would require a descriptive label. The remaining portions of Figures 1 and 2 are believed to clearly show structural elements that are not generic blocks. For the above reasons, it is respectfully requested that the objection to the drawings be withdrawn.

II. Double Patenting Rejection

The Examiner has rejected claims 1-21 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-12 of U.S. Patent No. 6,355,156. This ground of rejection is respectfully traversed.

Independent claim 1 of the present application recites:

A method of monitoring machining in an electrochemical machining tool assembly having first and second tools arranged on opposite sides of a workpiece so as to define first and second gaps with said workpiece, said method comprising:

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mounting a first ultrasonic transducer in said first tool;
mounting a second ultrasonic transducer in said second tool;
generating ultrasonic waves with said first and second ultrasonic transducers;
detecting arrival times of reflections of said ultrasonic waves at said first and second ultrasonic transducers; and
using said arrival times to calculate at least one of said first gap size, said second gap size, and thickness of said workpiece.

In contrast, claim 1 of U.S. Patent No. 6,355,156 recites:

A method of monitoring an electrochemical machining process, comprising the steps of:
embedding an ultrasonic sensor in an electrochemical machining tool to provide a tool assembly;
situating the tool assembly in a spatial relationship with a workpiece;
flowing an electrolytic fluid at least between the tool and the workpiece;
connecting the tool and the workpiece to a source of electrical power;
generating an acoustic wave from the ultrasonic sensor so as to propagate from the tool through the electrolytic fluid to the workpiece;
receiving reflections of the acoustic wave from the workpiece; and
based on the propagated acoustic wave and the reflections thereof, calculating measurement of at least one of a group consisting of (a) size of a gap between a cutting surface of the tool and a first working surface of the workpiece facing the cutting surface and (b) thickness of the workpiece between the first working surface of the workpiece and a second working surface thereof facing away from the first working surface.

The differences between the allegedly conflicting claims are substantial. Claim 1 of U.S. Patent No. 6,355,156 does not include monitoring machining in an electrochemical machining tool assembly having first and second tools arranged on opposite sides of a workpiece. Claim 1 of U.S. Patent No. 6,355,156 only pertains to a single electrochemical machining tool situated in a spatial relationship with a workpiece. Claim 1 of U.S. Patent No. 6,355,156 also fails to include the steps of mounting a second ultrasonic transducer in a second tool, generating ultrasonic waves with two ultrasonic transducers, and

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detecting arrival times of ultrasonic wave reflections at two ultrasonic transducers.

In light of these differences, applicant respectfully submits that there is no suggestion that the invention defined by claim 1 of the present application is an obvious variation of the invention defined by claim 1 of U.S. Patent No. 6,355,156. There is no teaching in the prior art of using two ultrasonic transducers instead of the single ultrasonic transducer recited in claim 1 of U.S. Patent No. 6,355,156. Only applicant discloses the idea of using two ultrasonic transducers. Claim 1 of U.S. Patent No. 6,355,156 does not even include two tools arranged on opposite sides of a workpiece. Although the drawings of U.S. Patent No. 6,355,156 show two tools, the disclosure of a patent may not be used as prior art when considering whether the invention defined in the claim of an application is an obvious variation of the invention defined in the claim of a patent (see MPEP 804).

None of the other claims of U.S. Patent No. 6,355,156 recite two tools arranged on opposite sides of a workpiece or using two ultrasonic transducers instead of the single ultrasonic transducer. Accordingly, it is respectfully submitted that the double patenting rejection of claim 1 should be withdrawn.

Claims 2-7 depend from independent claim 1 and are thus believed to be more than obvious variations of the inventions defined by claims of U.S. Patent No. 6,355,156 for the reasons set forth above. Furthermore, at least some of these dependent claims set forth additional limitations that are not obvious variations of the inventions defined by claims of U.S. Patent No. 6,355,156. For instance, there is no suggestion of detecting an arrival time of an ultrasonic wave from a second tool as required by claim 2 or calculating ultrasonic time-of-flight in a second gap as required by claim 3. Furthermore, claim 6 of the present application recites calculating workpiece thickness by

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subtracting the first gap size and the second gap size from the distance between the first and second tools. In contrast, claim 5 of U.S. Patent No. 6,355,156 obtains workpiece thickness based on the time-of-flight of an ultrasonic wave through the workpiece. None of the claims of U.S. Patent No. 6,355,156 recite detecting a position of a machined portion of the workpiece relative to a workpiece datum, as required by claim 7.

Independent claim 8 of the present application recites:

A method of monitoring machining in an electrochemical machining tool assembly having first and second tools, said method comprising:
mounting a first ultrasonic transducer in said first tool;
mounting a second ultrasonic transducer in said second tool;
situating a workpiece between said first and second tools so as to define a first gap between said first tool and said workpiece and a second gap between said second tool and said workpiece;
connecting a source of electric power to said first and second tools and to said workpiece;
flowing an electrolytic fluid through said first and second gaps;
generating ultrasonic waves with said first and second ultrasonic transducers;
detecting a first arrival time of an ultrasonic wave reflected from an interface between said electrolytic fluid and said first tool;
detecting a second arrival time of an ultrasonic wave reflected from an interface between said electrolytic fluid and a first side of said workpiece;
detecting a third arrival time of an ultrasonic wave reflected from an interface between said electrolytic fluid and said second tool; and
detecting a fourth arrival time of an ultrasonic wave reflected from an interface between said electrolytic fluid and a second side of said workpiece; and
using said arrival times to calculate at least one of said first gap size, said second gap size, and thickness of said workpiece.

As discussed above, none of the claims of U.S. Patent No. 6,355,156 recites includes monitoring machining in an electrochemical machining tool assembly having first and second tools arranged on opposite sides of a workpiece or using two ultrasonic transducers instead of the single ultrasonic

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transducer. And there is no teaching in the prior art of record to suggest that it would have been obvious to provide the inventions defined by the claims of U.S. Patent No. 6,355,156 with a second tool or a second ultrasonic transducer. For these reasons, it is respectfully submitted that the invention defined by claim 8 of the present application is not an obvious variation of the inventions defined by the claims of U.S. Patent No. 6,355,156 and the double patenting rejection of claim 8 should be withdrawn.

Claims 9-16 depend from independent claim 8 and are thus believed to be more than obvious variations of the inventions defined by claims of U.S. Patent No. 6,355,156 for the reasons set forth above. Furthermore, at least some of these dependent claims set forth additional limitations that are not obvious variations of the inventions defined by claims of U.S. Patent No. 6,355,156, just like claims 2-7 discussed above.

Independent claim 17 of the present application recites:

An electrochemical machining tool assembly comprising:
first and second tools spaced apart from one another so that a workpiece can be located therebetween;
a first ultrasonic transducer mounted in said first tool;
a second ultrasonic transducer mounted in said second tool; and
means for calculating gap sizes and workpiece thicknesses from arrival times at said first and second ultrasonic transducers of reflections of ultrasonic waves generated by said first and second ultrasonic transducers.

In contrast, claim 9 of U.S. Patent No. 6,355,156 recites:

An electrochemical machining tool assembly, comprising:
an electrochemical machining tool positionable in a spatial relationship with respect to a workpiece and positionable in contact with an electrolytic fluid disposed at least in a gap between said tool and the workpiece, said tool having a cutting surface facing the workpiece; and
an ultrasonic sensor embedded in said tool for generating an acoustic wave from said ultrasonic sensor to propagate from the tool

through the electrolytic fluid to the workpiece and to reflect back to the ultrasonic sensor for use in calculating measurement of at least one of a group consisting of (a) size of the gap between said cutting surface of said tool and a first working surface of the workpiece facing said cutting surface, and (b) thickness of the workpiece between the first working surface of the workpiece and a second working surface thereof facing away from the first working surface.

Claim 9 does not include the first and second tools spaced apart from one another so that a workpiece can be located therebetween or a second ultrasonic transducer recited in claim 17 of the present application. Claim 9 of U.S. Patent No. 6,355,156 merely recites a single tool and a single ultrasonic transducer. Furthermore, although it recites using ultrasonic waves generated by the single ultrasonic transducer to calculate at least one of gap size and workpiece thickness, claim 9 of U.S. Patent No. 6,355,156 does not actually recite a means for calculating gap sizes and workpiece thicknesses.

There is no teaching in the prior art of record to suggest that it would have been obvious to provide the inventions defined by the claims of U.S. Patent No. 6,355,156 with a second tool or a second ultrasonic transducer. For this reason, it is respectfully submitted that the invention defined by claim 17 of the present application is not an obvious variation of the inventions defined by the claims of U.S. Patent No. 6,355,156 and the double patenting rejection of claim 17 should be withdrawn.

Claims 18-21 depend from independent claim 17 and are thus believed to be more than obvious variations of the inventions defined by claims of U.S. Patent No. 6,355,156 for the reasons set forth above.

III. Prior Art Rejection under 35 U.S.C. § 103(a)

The Examiner has rejected claims 1-21 under 35 U.S.C. § 103(a) as being unpatentable over Raulerson et al in view of Ivestor et al. This ground of rejection is respectfully traversed.

Raulerson et al discloses a method and system for electrochemically machining a cylindrical, metallic workpiece 10 having an annular wall 12. The system includes a machining head 36 for machining the outer surface of the wall 12. One or more ultrasonic sensors 32 are positioned within the workpiece interior 26, which is filled with a fluid such as water. Alternatively, the sensors 32 can be located on the exterior surface of the workpiece wall 12, opposite of the machining head 36 as shown in Figure 2. As described in lines 2-12 of column 5, the sensors 32 sense the distance between the inner and outer surfaces of the wall 12 (i.e., wall thickness) during machining. There is no description in Raulerson et al of using the sensors 32 to determine the gap size between the machining head 36 and the workpiece 10.

Raulerson et al thus discloses positioning ultrasonic sensors within or on the surface of the workpiece being machined and as such fails to disclose mounting ultrasonic transducers in electrochemical machining tools, as required by independent claims 1, 8 and 17. Furthermore, Raulerson et al does not disclose using two tools as required by claims 1, 8 and 17. Raulerson et al only discloses the use of a single machining tool. The Examiner relies on the Ivestor et al reference for allegedly teaching calculations including multiplication and division of a signal. Ivestor et al does not disclose mounting ultrasonic transducers in electrochemical machining tools or using two such tools and does not teach or suggest modifying Raulerson et al to include these features. In fact, Ivestor et al pertains to an information storage and retrieval system that is completely non-analogous to the system of Raulerson et al. Thus, the combination of Raulerson et al and Ivestor et al fails to render independent claims 1, 8 and 17 unpatentable.

For the above reasons, it is respectfully submitted that independent claims 1, 8 and 17 are allowable over Raulerson et al and Ivestor et al. Claims 2-7, 9-16 and 19-21 depend from claim 1, 8 or 17 and are thus also believed to be

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allowable. Furthermore, at least some of these dependent claims set forth limitations not met by the prior art. For instance, there is no showing of detecting an arrival time of an ultrasonic wave from a second tool as required by claim 2, or calculating ultrasonic time-of-flight in a second gap as required by claims 3 and 9. There is no showing of calculating workpiece thickness by subtracting the first gap size and the second gap size from the distance between the first and second tools as required by claims 6 and 12, or detecting a position of a machined portion of the workpiece relative to a workpiece datum as required by claims 7 and 16.

In view of the above, it is submitted that the claims are in condition for allowance. Reconsideration of the objections and rejections is requested. Allowance of claims 1-21 at an early date is solicited.

Respectfully submitted,

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Date

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